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## THE PERISTOME. III.

By A. J. GROUT.

There can be no doubt that there is no exact homology between the peristomes of the Nematodontae and those of the Arthrodontae, for the teeth of the former are composed of masses of cellular tissue while those of the latter are composed of the thickened tangential cell walls (i. e., the cell walls parallel to the walls of the operculum) of one or more layers of cells. The joints or articulations from which this type of peristome takes its name are the places of intersection of these tangential walls with the horizontal cell walls forming the top and bottom of the cells. The rest of these horizontal walls and the entire vertical radial walls (i. e., those forming the sides of the cells) have been absorbed. If one were to take a pyramid consisting of a single row of rectangular boxes of graduated sizes and after fastening one side of them together in a straight line should knock away the other walls he would get a good idea of the formation of the arthrodont peristome. A narrow strip of the tops and bottoms must be left between the remaining sides to represent the articulations and the result would be comparable to only one-half a tooth of the outer peristome of *Hypnum*. Then if both sides be covered with a layer of plaster it will represent the thickenings laid on the original cell wall to form the lamellae.

While the arthrodont and nematodont types of peristome seem very distinct, there seems to be something of a connecting link in the peristomes of the Buxbaumiaceae as typified by the peristome of *Buxbaumia indusiata*. This peristome consists of an inner and an outer peristome, the inner of a plaited cone, truncate and with a narrow opening at the top, apparently for the gradual escape of spores, but Braithwaite quotes Zukal to the effect that the spores cannot escape through this narrow opening. This may be so in *Buxbaumia*, I have not had sufficient suitable material to decide for myself, but in the closely related *Webera sessilis* the spores certainly are dispersed through this narrow opening, though some of them may remain until the capsule decays as in *Buxbaumia*.

This inner cone is composed of a thin membrane made of the thickened tangential cell walls of one of the layers of cells and is plaited or folded like

*B. indusiata*: 1 and 2, peristome; 3, pseudannulus (a) and peristome (b) in vertical section, c, internal peristome; 4 and 5, teeth of external peristome; 6, portion of the same more highly magnified; 7-11, different transverse sections of the teeth of the external peristome. *D. foliosum* (*Webera sessilis*): D1, peristome magnified; D2, a single tooth; D3, vertical section of the peristome, operculum, and capsule wall; D4, folds of the internal peristome in transverse section.



a half opened fan. The structure of this cone is most easily understood by consulting Plate VI, Fig. D1. The structure of this is almost exactly like that of *Buxbaumia* shown on a smaller scale at 2 under *B. indusiata*. It corresponds very closely in structure and development to the basal membrane of the inner peristome of *Bryum* and *Hypnum* and their allies, only in *Buxbaumia* the upper part is continuous instead of being broken up into segments and cilia.

The teeth of the outer peristome are constructed much like those of the ordinary arthrodont type. They are well illustrated in figs. 4, 5 and 6 under *B. indusiata*, and are shown in cross-section in figs. 7, 8, 9, 10 and 11. In these last figures the original cell walls are indicated by the lighter T shaped central portion while the remainder consists of the thickening added on and forming the plates or lamellae. The top of the T is the tangential wall while the stem is a portion of a vertical radial wall included between the lamellae. But instead of a single row of these teeth there are several as shown in fig. 2 under *B. indusiata*. Outside of these teeth and between them and the outer wall of the capsules is a mass of cells which is called the crown or pseudannulus, which may perform the functions of an annulus but is in no way homologous with it (*B. ind.* 3). M. Philibert considered these cells and the several rows of teeth as homologous with the outer rows of cells in the teeth of the Nematodonteae, the several rows of teeth being composed of the thickened papillose tangential walls of a portion of the peristomial tissue while the pseudannulus corresponds to the outer layers of the same.

This view is borne out by *B. aphylla* in which the outer teeth are almost lacking and the pseudannulus is much thicker and is thickened and papillose on its inner cell walls. According to this view then, the peristome of *Buxbaumia* is formed of tissue homologous to that of the teeth of *Polytrichum* by the thickening of the tangential walls of a few rows of cells and the absorption and disappearance of the rest of the tissue. Apparently these outer teeth in *Buxbaumia* have no function and consequently have not become fixed by natural selection. At any rate they are immensely variable in all the species. In *B. aphylla* the outer teeth are scarcely present at all. In the closely related *Webera sessilis* the inner peristome is essentially the same as in *Buxbaumia* except that the folds are but 16 and there is but one rudimentary outer row of teeth, thus approximating to the arthrodont type. How Lindberg, C. Mueller, and Braithwaite can deny the closer relationship of these two genera in the face of Schimper's figures reproduced here is a mystery to me.

While this type of peristome is evidently intermediate between the nematodont and the arthrodont types, M. Philibert's conclusion that it represents a primitive type needs to be considered with a good deal of caution in view of its evident functional and structural degeneracy. The variation which Philibert notes as probably preceding the fixed types of the Arthrodonteae may as well be explained by degeneracy. When we consider how many other species of mosses with a similar habit, e.g. *Pottia*, *Physcomitrium*, *Pleuroidium*, and *Mollia viridula*, have degenerated in respect to their peristomes, it lends added weight to the theory of the degeneracy of the peristomes of the Buxbaumiaceae.